

Space News Roundup

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National Aeronautics and Space Administration

STS-6 launch slips, leak checks continue

Launch of the STS-6 mission has been postponed from late January to late February to allow adequate time to pinpoint the source of a hydrogen leak discovered during a flight readiness firing last month.

A second flight readiness firing (FRF) has been scheduled for late January as a confirming measure in preparing the new Orbiter *Challenger* for launch.

"We have determined that a confirming flight readiness firing is the prudent course," said Lt. Gen. James A. Abrahamson, NASA Associate Administrator for Space Flight.

During the initial FRF on Dec. 18, *Challenger's* three main engines roared to life for 20 seconds, but a high level of gaseous

hydrogen in the aft compartment of the Orbiter caused concern among NASA management. Since that first test firing, numerous leak checks have been conducted and several minor leaks repaired. These included a leak which developed when a cooling tube split in the number three main engine nozzle. Repairs began on the cooling tube crack last week and were scheduled to be completed with a final epoxy application to seal the weld earlier this week.

The Dec. 18 FRF was the culmination of a 56-hour terminal countdown demonstration which included full fueling of the Shuttle's external tank in a process nearly identical to that of normal launch procedures.

The primary payload for STS-6, the Tracking and Data Relay Satellite, was transported to the pad along with its Inertial Upper Stage booster Dec. 27 in preparation for loading into the payload bay of *Challenger*. A series of tests were performed to verify communications and mechanical links and were judged successful. Fueling of the IUS was postponed, however, and the TDRS will be moved back to the Vertical Processing Facility to safeguard the payload during the second engine firing.

On Jan. 4, Mobile Launcher Platform-1, the platform used for the first five Shuttle missions, was moved into the Vehicle Assembly Bldg. for the start of the STS-7 stacking process.

Physicians to fly on missions seven and eight

Dr. Norman E. Thagard and Dr. William E. Thornton have been added to the crews of STS-7 and STS-8, respectively.

Thagard and Thornton, both physicians, have been added to help conduct medical tests to collect additional data on several physiological changes associated with adaptation to spaceflight. These tests, geared to study the space adaptation syndrome, will focus on the neurological system and are a continuation of the in-flight studies made on STS-4 and STS-5.

Roughly one third of all humans who have ventured into space have suffered moderate to severe symptoms associated with space adaptation problems. Another third experience some symptoms or discomfort and the remaining third are generally unaffected.

Basic research into the problem has been underway for several

years within NASA, primarily at JSC and the Ames Research Center. NASA has requested additional funding in the next budget to step up this research.

Thagard will join STS-7 Commander Robert L. Crippen, Pilot Frederick H. Hauck and Mission Specialists John M. Fabian and Dr. Sally K. Ride. It will be the first time five Americans have journeyed into space. The six-day flight is scheduled for launch aboard the Orbiter *Challenger* in April 1983.

Thornton will join STS-8 Commander Richard H. Truly, Pilot Daniel C. Brandenstein and Mission Specialists Dale A. Gardner and Guion S. Bluford Jr. for the four-day mission scheduled for launch in late June of 1983.

Thagard is a native of Florida and considers Jacksonville to be his hometown. He attended Florida State University where he

received bachelor and master of science degrees in engineering in 1965 and 1966 and later earned his doctor of medicine degree from the University of Texas Southwestern Medical School in 1977.

In 1966, he entered active duty with the Marine Corps Reserve and achieved the rank of captain in 1967. In 1968 he was designated a naval aviator and flew F-4 Phantoms with VMFA-333 at the Marine Corps Air Station in Beaufort, South Carolina and flew 163 combat missions in Vietnam from January 1969 to 1970. He has been awarded 11 Air Medals, the Navy Commendation Medal with Combat V, the Marine Corps "E" Award, the Vietnam Service Medal and the Vietnamese Cross of Gallantry with Palm.

Thagard was selected as an astronaut candidate in 1978 and

(Continued on page 2)

NASA schedules 23 launches in 1983

Five scheduled Space Shuttle flights and 18 unmanned launches will make 1983 a busy year for launch teams throughout the NASA system.

Shuttle orbiter *Challenger*, *Columbia's* sister ship, will make its debut early in the year with its first orbital flight scheduled for sometime in February.

The flight, designated STS-6, will deliver into orbit the first Tracking and Data Relay Satellite. Eventually, a network of three such spacecraft (including an on-orbit spare) will permit nearly continuous two-way communications with orbiting Shuttles.

Challenger is also slated to fly STS-7, currently set for late April, and STS-8, scheduled for early July.

The STS-7 mission will launch two Canadian communications satellites and an Indonesian communications satellite.

Also carried on STS-7 will be a pallet of NASA-sponsored experiments and a German experimental satellite called SPAS-01.

Challenger's third flight, STS-8, is scheduled to begin with a spectacular nighttime liftoff. In the cargo bay will be the second Tracking and Data Relay Satellite, TDRS-B, and a combined communications and weather satellite being launched for India.

While *Challenger* is operating, the orbiter *Columbia* will be undergoing modifications at Kennedy Space Center, Fla.

Columbia, which logged more than 10 million miles during four development flights and the Space Shuttle's first operational missions, will return to service on the STS-9 Spacelab 1 mission with an international crew of six. The research mission, scheduled for October, will be the first flight of the European-built Spacelab.

The final Shuttle flight of the year will be flown by *Challenger* in December with Department of Defense cargo aboard.

At the same time operational Shuttle activity is picking up, expendable vehicle launch teams will be busy with a roster of un-

manned missions. Eight launches of the workhorse Delta rocket are forecast for 1983, along with two Atlas Centaur, two Atlas F and six Scout launches.

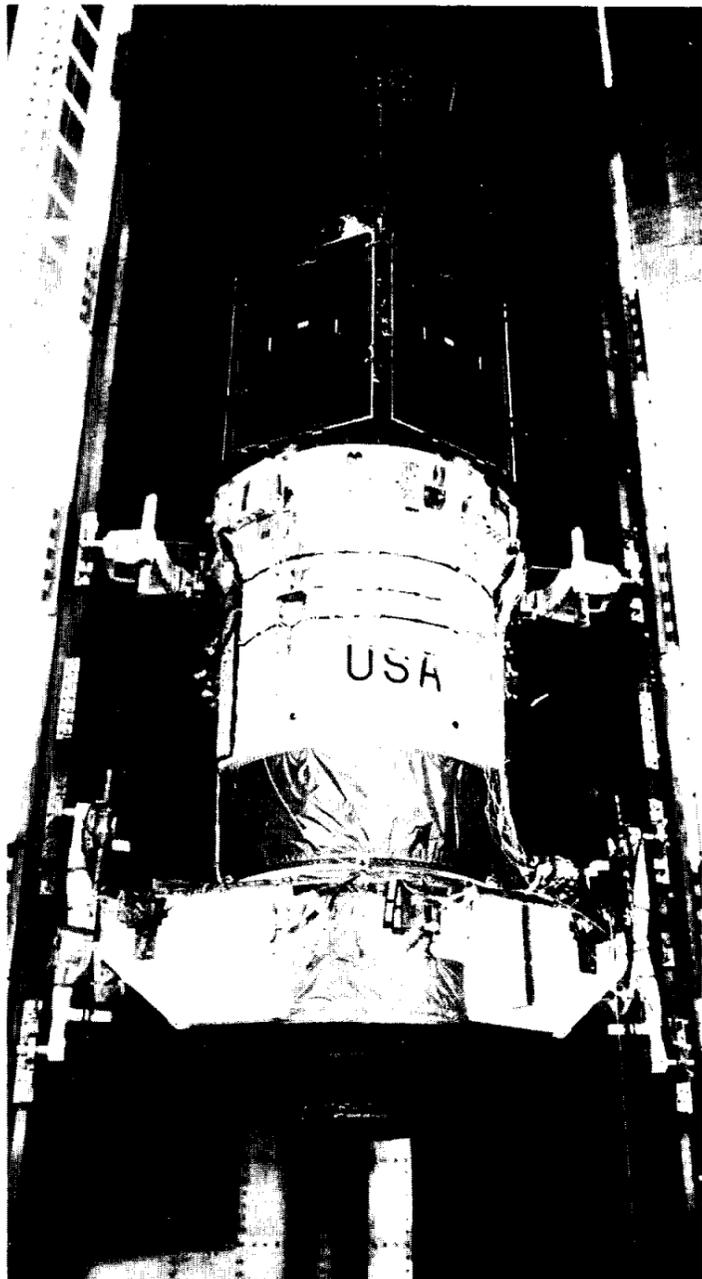
An Infrared Astronomical Satellite (IRAS) to be launched late in January on a Delta rocket from the Western Space and Missile Center in California leads the 1983 expendable vehicles schedule.

The Intelsat V-F will also be boosted into orbit from Cape Canaveral no earlier than March 10, using an Atlas Centaur rocket.

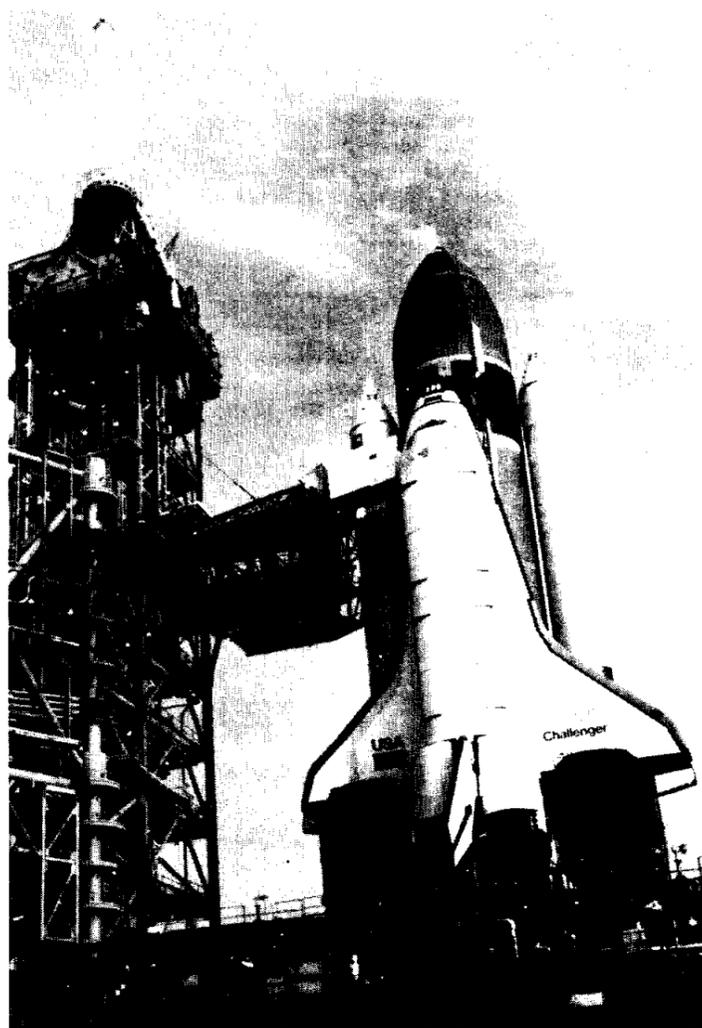
In March, the NOAA-E will be launched aboard an Atlas rocket from the Western Space and Missile Center. The payload includes the search and rescue instruments developed by Canada and France. It will join the Soviet Union's COSPAS satellite, already in orbit, to form an experimental international satellite-aided search and rescue system.

RCA-F in March and NOAA's GOES-F, Geostationary Opera-

(Continued on page 2)



The first Tracking and Data Relay Satellite, attached to its Inertial Upper Stage booster, is shown suspended in the payload changeout room at the Cape as preparations for the STS-6 mission continue. The Orbiter *Challenger*, meanwhile, is at the pad where checks for an unexpected hydrogen leak are being conducted. The launch is now scheduled for sometime in late February.



Space News Briefs

NASA, SPACECOM modify TDRSS contract

NASA and the Space Communications Co. (SPACECOM) have agreed to a modification in the Tracking and Data Relay Satellite System contract which will give NASA greater control and flexibility over the system, as well as the potential to extend its lifetime by several years. The modification was agreed to after two years of study, and will allow NASA to take over the use of the commercial telecommunications portion of TDRSS, the Advanced Westar. SPACECOM, a partnership affiliated with Continental Telecom, Inc., Fairchild Industries and the Western Union Corp., will be paid \$216 million as compensation for its Advanced Westar investment and related costs. For NASA, control of TDRSS will permit schedule and performance requirements based solely on the needs of the space agency and other government users, eliminating any potential conflicts with commercial operations. SPACECOM will continue to own and operate TDRSS — leasing the service to NASA — for a 10-year period beginning in 1983. The system will revert to NASA ownership in 1993. The contract modification will make six satellites available for TDRSS services. Three will be located in geosynchronous orbit, one of them an in-orbit spare, and three more will be available as spares on the ground. The ground spares could be modified to take advantage of new technologies involving different frequencies and higher data rates.

ESA identifies five possible science missions

Out of 20 proposals for new starts on science missions, the European Space Agency has chosen five for continued study toward new missions in the late 1980s and early 1990s. The proposals include plans for a space telescope for far infrared and sub-millimeter studies of the galaxy, a galactic and globular cluster X-ray multi-mirror, a solar outer atmosphere observatory, an Earth plasma and magnetospheric mission and a probe to study the three main asteroid belts. The scientific advisory bodies of the ESA also concluded that negotiations with NASA should be undertaken in connection with a proposal for a Saturn orbiter and Titan probe christened CASSINI, with a view toward developing a cooperative mission.

Europa said to have life support potential

In the recently released sequel to his *2001: A Space Odyssey*, novelist Arthur C. Clarke takes humans back to the environs of Jupiter, where some of his characters encounter organic lifeforms thriving beneath the ice-covered ocean of Europa. But while scientists are not convinced that any type of indigenous life now exists on that Jovian satellite, the speculations in Clarke's *2010: Odyssey Two* may not be far off the mark. A paper presented recently at an American Geophysical Union meeting by two Ames Research Center scientists concludes that some hardy Earth organisms could be sustained in the European ocean if transplanted there. Steven Squyres and Ray Reynolds say substantial evidence exists that Europa has a planet-wrapping ocean of liquid water perhaps 30 miles deep which is covered by a protective layer of ice about three miles thick on the average. The combined heat of radioactive decay of Europa's rocky core and the tremendous tidal forces of nearby Jupiter are enough to keep the water on the satellite in liquid form. Sunlight seeping through vents in the ice cover would provide enough energy for photosynthesis to occur, as it does on Earth beneath the permanent ice of Antarctic lakes, they said. Those and other factors would suggest the possibility for organic life to exist in limited areas for limited times, they concluded. Reynolds was the author of the paper which predicted volcanoes on the Jovian moon to before Voyager photographs confirmed their presence.

Over a million calls made to 900 number

Some 1,076,000 calls were made to the special 900 number during STS-5, in which callers could dial up NASA mission audio and listen in on air-to-ground conversations and mission commentary sent out from JSC. For the first time, the number was accessible from outside the United States, with some 308,000 calls made from foreign countries. The majority of overseas calls came from West Germany and South Africa, according to AT&T. The number was advertised in the Asian Wall Street Journal four times and in the International Herald Tribune five times. Some 768,000 calls were made from the U.S.

Australia to fly payload specialist

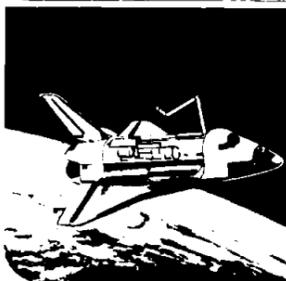
The Australian government and NASA have announced plans to fly a payload specialist on the Space Shuttle in 1985 on one of two missions set to launch the satellites of that country's national satellite system. The offer was based on the new NASA policy which expands customer opportunities to fly their own personnel on Shuttle missions. Australia is the first country to formally announce the intention to take advantage of the policy. The Australian Department of Science and Technology will be responsible for the selection of crews and other arrangements in association with AUSSAT, the operator of the satellite system. The two Australian satellites will be used for direct television broadcast and voice, data and public telephone services to continental Australia and offshore territories.

Space ranks high on national reading list

Space related books were high on the national reading list in December, according to the Houston Chronicle. The top four books on the New York Times best sellers list for fiction were held by books which deal with space-related topics. James Michener's *Space*, a fictionalized account of the birth and growth of NASA, was number one on the list. Clarke's *2010: Odyssey Two*, Kotzwinkle's *E.T.* and Asimov's *Foundation's Edge* rounded out the top four. Number 11 on the list was Adams' *Life, the Universe and Everything*, the third volume in his *Hitchhiker's Guide to the Galaxy* trilogy.

NASA
Lyndon B. Johnson Space Center

Space News Roundup



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Editor

Brian Weich



A few issues back, the Roundup published photos of the losing entrants in the latest Shuttle Regatta, which in the case of that race meant they came in dead last. The crew of *Panache*, however, recently proved there is more to seamanship than just one race. Skipper Neil Hutchinson and crewmembers John Cox, Leonard Nicholson, Larry Griffin, Gerald Griffin, Dave Walker and Don Williams and several others not pictured here placed second overall in their category in the Fall Series of races sponsored by the Galveston Bay Yacht Club, one of the most demanding series of races in the area. The crewmembers were delighted to show how the Turtle Trophy from the Shuttle Regatta is swallowed by the cup from the Fall Series races. Said the skipper: "In the Shuttle Regatta, we zigged when we should have zagged. In the Fall Series, we zagged when we should have zigged."



People

From our *We Wish It Was That Simple* Department comes this tale of efforts by students at a junior high school in Keene, New Hampshire to help NASA

deal with the space adaptation syndrome. A tongue in cheek article in a back issue of *Science 81* about the American Society for the Conservation of Gravity (ASCG) prompted the students at Keene Junior High to come up with an equally wry solution of their own to the space sickness problem. In view of the ASCG's claim that "a single moon rocket launching used more gravity in a few moments than the entire world used during all the 18th Century," the Keene science students decided to bottle some of their gravity and ship it off to NASA. Accordingly,

"on Dec. 6, all the members of our science classes at Keene held on to their desks for one full minute," wrote science teacher Robert Lefebvre. "The gravity saved by this sacrifice was packaged in balloons for use by astronauts, since a lack of gravity seems to be the cause of motion sickness. We have also started turning off gravity as we leave the room to help conserve this great natural resource," he wrote. Lefebvre also said the project was good justification for teaching Newton to his students, which is also pretty keen.



Some 54 employees of the Space and Life Sciences Directorate were presented with performance awards by Director W.E. Rice recently. The awards had a total monetary value of over \$17,000 for the deserving employees. The Directorate was the first to make such awards under a new JSC policy which permits a larger number of awards of lower monetary value.

Physicians to fly

(Continued from page 1)

joined the corps in 1979. Thornton, who designed the micro-g treadmill already used on several Shuttle flights, has been an astronaut since 1967. He is a native of North Carolina and graduated from the University of North Carolina with a bachelor of science degree in physics in 1952 and a doctorate in medicine in 1963. After completing Air Force ROTC training, he served as officer-in-charge of the Instrumentation Lab at the Flight Test Air Proving Ground. He later became a consultant to the Air Proving Ground Command. After earning his M.D. and completing internship training at Wilford Hall USAF Hospital at Lackland Air Force Base in San Antonio, Thornton returned to active duty and was assigned to the USAF Aerospace Medical Divi-



Dr. William Thornton

sion there. It was during his tour in San Antonio that he became involved in space medicine research and subsequently applied to and was selected for the



Dr. Norman Thagard

NASA astronaut corps in 1967. He was a member of the astronaut support crew for the Skylab 2, 3 and 4 missions. He holds more than 15 issued patents.

Launch schedule

(Continued from page 1)

tional Environmental Satellite, in April will be launched from the NASA facility at Cape Canaveral on Delta rockets.

In May, a Scout rocket will be used to launch the San Marco-D/L, an international cooperative project with Italy, from the San Marco Range in the Indian Ocean.

The June launch of the DNA mission will use a Scout as the booster from the Western Space and Missile Center, while the Hughes communication satellite, *Galaxy-A* will be carried by a Delta rocket from the Eastern Space and Missile Center in Florida.

The Scout will also put the Navy-21 into orbit for the Depart-

ment of Defense, during July from the Western Space and Missile Center, and a Delta will be used to hoist TELSTAR-3A aloft for American Telephone & Telegraph in late July from NASA's Florida facility.

Three unmanned missions are scheduled for August, including a DOD payload designated AF-1 (ITV) using a Scout, for launch from the Wallops Flight Facility, Wallops Island, Va. A NOAA weather satellite, NOAA-E, using an Atlas will be launched from Western Space and Missile Center and the RCA-G will be carried by a Delta rocket from its Florida launch site.

The Hughes communications satellite, *Galaxy-B*, set for a mid

September launch and the military communications satellite NATO-III-D, scheduled for October, will both be launched from the Eastern Space and Missile Center using Delta rockets.

The DOD has scheduled Navy-22 for a fourth quarter launch from the Western Space and Missile Center and the Air Force will launch its satellite AF-2 from the Wallops Flight Facility using a Scout as the carrier vehicle.

The current schedule for unmanned vehicles for 1983 ends with a December launch of Intelsat VA-A aboard an Atlas Centaur in Florida.

Interview

Gene Kranz

Of spaceships, flight control and exploration
from a man who helped write the book

Former JSC Director Chris Kraft was pressed one day by a questioner to look back on the days when control techniques for spaceflight had to be developed from square one. As he reached back through his memory, recalling the faces and the names, the meetings and the slow methodical thrashing out of countless issues fundamental to successful spaceflights, Kraft smiled and settled on one face in particular, and paid that person what is in his world one of the highest compliments possible. "If there is any single individual," he said, "that had more to do with developing flight control techniques than anybody else, it was Gene Kranz. He is Mr. Flight Control."

Kranz came to work for the Manned Spacecraft Center in 1960, when flight control was less in its infancy than still in the womb. "He was there when it started from zero," Kraft remembered. "He is truly an outstanding individual in his field. He is the best."

Accolades from his peers are not uncommon in Kranz's career. He has received two NASA Exceptional Service Medals, two Distinguished Service Medals, the Presidential Medal of Freedom, the NASA Outstanding Leadership Medal, the Arthur S. Flemming Award and several others. He was an assistant flight director to Kraft during the Mercury days, and a flight director himself during Gemini, Apollo and Skylab. He is now Deputy Director of Flight Operations and STS Flight Operations Director, positions from which he heavily influences the nature of American spaceflight control, now as always widely regarded as the very best there is.

In the midst of the busy atmosphere surrounding NASA's move into Shuttle operations, Kranz sat down recently and answered a few questions:

Roundup: What is the most important thing we'll do in the new year? Establish our EVA capabilities on the Shuttle?

Kranz: No, I think that's really a subset. I think you have to go back to a more global set of objectives, and in 1983 probably the most important thing that will happen is we'll have demonstrated the Space Transportation System capability to the customers we'll be flying for and the rest of the commercial community, and the customers I know are out there. They will recognize the Shuttle's capabilities. The continuation of our flight activities will start bringing in the next generation customers that are needed in 1986 and subsequent years. So I believe we'll demonstrate the reliability of the Space Transportation System toward the objective of making space economically attractive and available to the commercial and military communities.

Roundup: NASA this year will also be seeking funds for a fifth and possibly a sixth Space Shuttle Orbiter. What would you say to those who remain unconvinced that NASA needs one or two additional vehicles? If you could sit down and have a talk with David Stockman, what would you tell him?

Kranz: I would try to point out to him the various eras of technological change that have come since the start of the Industrial Age. You would take a look at the applications of such things as the internal combustion engine and how it has been utilized far beyond transportation. It provides power to drive machines which produce electricity and pump water for ir-



Four views of a Control Center mainstay: Kranz as Flight Director during Gemini 9, top left; reacting to the unscheduled hold during the first STS-1 launch attempt, center; punching up a display during STS-4, top right; and sharing a cigar with Glynn Lunney and Gerald Griffin at the conclusion of Apollo 7.

rigation and so on. Then I would move into the advent of the transportation industry and beyond that into the computer industry and look at the advanced digital transmission systems which arose, and you can see how each of these industries expanded several orders of magnitude within the first 10 or 15 years of their introduction. I think the same thing will be true of the applications of space. We've got several experiments flying that are oriented toward production technology. The production cold flow electrophoretic separation, for instance, will supply the raw materials for a vast amount of medical and biological and genetic research. It doesn't take much to expand into other fields, like agriculture. The Park Seed Co. GAS payload on the next flight is one example. Customers are out there, and it would be disastrous to underestimate the potential market. Once you shut down the production lines, it is many years before you can establish them again for additional orbiters. So if I was talking to David Stockman, I would talk to him about faith in America, and in particular, faith in the American economic system. The people are out there to exploit the technology. What we don't want to do is to be on the short end of the supply curve, where we can't supply the services needed by American industry. It also provides an opportunity not only for the U.S. domestically, but in our balance of trade. The basic issues associated with exporting technology to other countries are very important. We know we cannot compete with other countries very well in such things as textiles and automobiles. We should recognize that one area where we can compete is in space applications. This is a new era in technological competition. The basic issue with David Stockman would be to address to him the basic tenets of faith in the United States, faith in our economic system and the need to remain competitive in this new environment.

Roundup: It has been said that the very definition of capitalism is the presence of constantly expanding markets. Does space represent that?

Kranz: I believe space and space technology spinoffs are the next expanding markets. The Shuttle is

truly a revolutionary spacecraft. You can look at data processing and see how the computer is now a reliable system and can provide the depth to sustain many failures and keep the principal functions going. It is very dramatically needed for industrial processes. You've got the technology developed to create the Shuttle thermal protection system. You've got the analyses methodology applicable to many of the emerging industries in the U.S. So you've got not just the Shuttle, but the spinoffs and derivations, the forcing of the technology that the Shuttle has provided. That has been true of space since the very early days. Space forced certain types of technology to be created which could then be exploited. This is probably without question the driving technological force in the United States today. What we cannot afford to do is underestimate the market.

Roundup: Do you think it true that in Shuttle we are drawing on the technology supplied by the driving force of Apollo, and secondly, will we see the use of the technology of here and now — rather than 1960s and 1970s technology — applied soon to Shuttle? Or is it there now?

Kranz: That's a difficult question, but I think I have a relatively straightforward answer. The principal derivative from Apollo and previous programs was not the technology but the management processes. The true benefits of Apollo were the management perspective, the management attitude and the system engineering we learned, the methodology by which we envisioned and then implemented very bold and dramatic steps forward. I believe that what we learned about managing a large system was the principal derivation. Now for the Shuttle itself, there are certain improvements you can always consider on a flying system. I describe the *Columbia* as a very battle-hardened spacecraft. In our role as operators, one of our basic tenets is to try and find the holes in the architecture of the system, and we do this in the process of developing the procedures, accomplishing our training and right on down the line. There are very few holes in the Orbiter architecture. In fact, the depth of the system is such that if you go back to STS-2, when

we developed the concept of a minimum mission, we did so because of a major powerplant failure, but we were so convinced of the integrity and the depth of the remaining systems that we elected to continue until we performed what we considered a high priority mission. Technologically and architecturally, the orbiter is good for the next 20 years, which is exactly how we intended to build it. It is the DC-3 of the space age. In fact, I wouldn't doubt there will be shuttles flying well beyond 20 years. When we've got new generation spacecraft, just as when the 707 came out you still saw DC-3s flying, there will be Orbiters flying for a long time thereafter. It is a magnificently engineered system with the depth needed to provide reliability and in particular to keep flying in light of one or two or three failures. After we got over the minor inconvenience type of things in the first few missions, we have developed what is basically a perfect spacecraft, the most perfect spacecraft in the history of spaceflight. And this was after *Columbia* had flown five missions. We had only about six items in this last flight that were even worth talking about from a malfunction standpoint. The least number of malfunctions we ever saw in the Apollo missions was something like 18. And each one of the Apollo spacecraft was a virgin spacecraft, once up and that's it. And here we've flown this one five times and we only have six problems.

Roundup: Another subject. What was it, 20 years ago, when Bldg. 30 was under construction — did you ever let your mind wander back then, and if you did, could you have roamed forward and imagined yourself sitting here in Bldg. 1 looking out over a program like the Space Shuttle?

Kranz: I've always tried to be 20 years out in front of the program. I have been interested in space since the very early days, and this goes back into the period immediately after the Second World War, when the spaceflight proponents provided a large amount of theoretical documentation on the possibilities of using rocketry for everything from near-Earth to interplanetary travel. One of my school papers was on the subject of interplanetary travel. Later, I got

involved in aircraft as a military pilot, and then the opportunity came to become involved in space and I took it. I thoroughly enjoy and believe in what I would say are the practical aspects of science fiction. "2001" and "Star Wars" are really not that farfetched anymore. If you take a look at the proposal they've got for the development of a space operations center, it has many of the aspects of the facilities in "2001." I look forward to the next 20 years as possibly the most exciting in history. I believe every step we take here on the ground to make space economically feasible is a step toward eventual space colonization. The next generation of control facilities is probably the most interesting. Right now, my interests fall into three general areas related to this. The first thing is the realization of the basic goals and objectives we set down in our STS Baseline Operations Plan, which is to become more competitive from the aspect of ground support, i.e., to reduce the overhead of the program through innovative techniques. So that's the first of my personal goals. The second is to translate that which we have learned from the operations in the control center into the space operations center, because I believe the next generation of flight controllers will be operating not from the ground but from within a space station. And therefore I'm interested in developing those basic tools needed for on-orbit flight control. And then I believe that the third step that intrigues me is the development of what I consider a practical autonomous spacecraft.

Roundup: What is that, exactly?

Kranz: Basically, if you look at it in the broadest sense, everything you need to do the job is onboard. They would be fully competent and capable on their own. I'm interested in getting a complete definition of the cooperative role between ground and space and provide that aboard the spacecraft. There are certain things, of course, which we'll always sustain here.

Roundup: Well, could you say that a vehicle like the 747 is truly autonomous in this sense?

Kranz: It has what I would call practical autonomy. It still relies on man-tended ground based navigation aids. It has tower operators, and of course it has to be maintained. But in the air, they are the ones in control. When you start talking about spacecraft, however, there is an added element of autonomy which can be expanded on in the future. Unlike an aircraft, it can stay there for an extra one, two or three days, and you therefore have the ability to work around a large number of problems. We can do maintenance inside and outside the spacecraft.

Roundup: Dr. Kraft once said that people who aren't scared during a launch just don't understand the business. Do you have a flip flop somewhere down inside when we launch Shuttles?

Kranz: Yes, it's never changed. Yeah, there is a flip flop, it's very profound. The key thing is we recognize there are certain spots in any mission where things have to go absolutely perfectly and you have to depend on the equipment. And no matter how well you design equipment, the potential for failure is always there and it never changes. Now, once you are on-orbit, if you have time, you can work the problem and solve the problem.

(Continued on page 4)

Gilruth Center News

Call x3594 for more information

Defensive driving — Learn to drive safely and qualify for a 10% reduction in your auto insurance for the next three years. This class meets from 8 a.m. to 5 p.m. Saturday, Jan. 22 at a cost of \$20 per person. Space is limited.

Yoga — Classic Yoga exercises are designed for those who desire to gain inner peace, awareness and control of their bodies. Yoga promotes health and a sense of aliveness in everyday life. Class runs from 7 to 8 p.m. Tuesdays at a cost of \$20 per person.

Country western dance — This popular class is available beginning Jan. 10, running from 7:15 to 8:45 p.m. and 8:45 to 10:15 p.m. on Mondays. Cost for the course is \$20 per couple, limit 15 couples.

Children's movie — The next movie will be the Looney Bugs Bunny Movie, to be shown from 10 a.m. to noon Jan. 22. The \$1 admission cost includes popcorn and soft drinks. Tickets are on sale at the Bldg. 11 Exchange Store.

Ladies self-defense — Learn the basic skills of self-defense by signing up for this two-week course. Class begins Jan. 3 and runs from 9 a.m. to noon at a cost of \$30 per person.

Bulletin Board

JSC hosting training conference

JSC will be the host for the Joint Federal Women's Program Manager/Hispanic Employee Program Manager training conference Jan. 17 to 20. Representatives from each of the NASA centers will be meeting at the Gilruth Center for training which will emphasize management skills and techniques. If you are interested in learning more about either program, contact Carlos Ramirez at x4831.

Space manufacturing conference set

The Sixth Princeton Conference on Space Manufacturing will be held May 9 to 12 at Princeton University with discussions ranging from space stations and habitats to electromagnetic accelerators and extraterrestrial materials processing. Co-sponsors of the conference are Princeton University and the Space Studies Institute. Dr. Gerard K. O'Neill, Professor of Physics at Princeton and President of the SSI, will chair the conference organizing committee. For information on reservations and schedules, contact April Whitt at SSI, Box 82, Princeton, New Jersey, 08540; (609) 921-0377.

Blood drive schedule for '83 listed

The JSC community is again working with St. Luke's Hospital to provide a constant source of blood for the 13th straight year. In 1983, 20 different opportunities will be given for JSC and contractor employees to contribute to this worthy cause. All blood drives except those sponsored by Ford Aerospace will be held at the Gilruth Recreation Center. The JSC drives will be April 4 and 7, August 16 and 18 and December 5 and 8. For appointments, call Helon Crawford, x5238; Bob Jones, x6364; Jim McBride, x6226; or Les Wynn, x3918. The Lockheed blood drives will be held March 10, June 16, September 8 and December 15. For appointments, call Bob Bose or Janelle Bennett at 333-5411. The Rockwell blood drives will be held January 25, May 5, September 15 and December 13. For appointments, call Frances Mussmann, 333-2030, x124. The McDonnell Douglas blood drives will be held February 3, June 2 and October 13. For appointments, call Ralph Patterson or Jeannie McQuillion at 488-5660, x212. The Ford blood drives will be held March 31, July 21 and November 17 in the Ford Bldg. 1 auditorium. For appointments, contact 486-6231, x230.

Tapes of MADD presentation available

Tapes of the Mothers Against Drunk Driving presentation Dec. 3 are available for loan from Kay Ebeling in the Safety Office by calling x2719. Those personnel who were unable to attend this moving presentation can still get some perspective on the problem by checking out the tapes, Ebeling said.

Kranz

(Continued from page 3)

Roundup: What are the most harrowing moments you remember having in the control center?

Kranz: There are two times which stand out very strongly. In fact, I'd say there are three. The first was on Gemini 8...well...boy, that's really hard to say. I could go right on down the line the more I think about that question. I guess the first was in Mercury Atlas 6 where we decided to reenter John Glenn with the retropack on. We did not have the supporting data to say that from a standpoint of the thermal shield or from an aerodynamic control capability that we should do that. The second was during Gemini 8, when we came close to losing the majority of our reentry control system propellant because we had a stuck-on thruster back on the aft end of the Gemini and it took us too long to recognize that problem. The third time was during Apollo 11 when we finally came to a point during the descent profile when we had done everything we could for the crew and we were just watching their propellant going down and down. We knew they were in the vicinity of the Moon but we also knew they had only seconds of fuel remaining. Depending on how you compute, we had anywhere between seven and fourteen seconds left. We had fought that guy all the way down to the surface and from there on it was at the point of knowing we couldn't do

anything more than be quiet and give the crew the opportunity to land and the only thing we could do was just count down to them the fuel remaining. I'd say my pulse rate was reasonably high then. The final time was during Apollo 13, after fighting the problem for an hour, that this dawned on me personally that we weren't going to be able to satisfy our mission objectives and the whole

when we do a flight to Mars, but I'll be here somewhere in spirit because I don't think I'll ever leave the control center or the flight control teams or the flight crews. My real desire is to develop the people and the organization and the flight control teams and the training processes that would allow us to go to Mars. I feel we'll go. I don't think there is any question, certainly not if we'll go but

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gameplan was one that was changing from landing on the Moon to becoming an issue of survival. And that was probably the most frustrating time because it represented the first time we had ever had to totally and absolutely turn away from our objectives and look toward survival.

Roundup: One last question. Will you be around when we do a flight to Mars?

Kranz: I don't know if I'll be here

when. My principal concern is to build the foundations in spaceflight from the standpoint of control teams, training, basic vehicle and operating concepts, and I think that has been the job I've most enjoyed. I've enjoyed the people here more than in any job I've ever had. The key thing is when it comes time to go, we'll have left strong teams in place to continue the work. And I think we've got that kind of a team now.

Cookin' in the Cafeteria

Week of January 17-21, 1982

Monday: Chicken Noodle Soup; Weiners & Beans, Round Steak w/Hash Browns, Meatballs & Spaghetti (Special); Okra & Tomatoes, Carrots, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Beef & Barley Soup; Beef Stew, Shrimp Creole, Fried Chicken (Special); Stewed Tomatoes, Mixed Vegetables, Broccoli.

Wednesday: Seafood Gumbo; Fried Perch, New England Dinner, Swiss Steak (Special); Italian Green Beans, Cabbage, Carrots.

Thursday: Cream of Chicken Soup; Turkey & Dressing, Enchiladas w/Chili,

Weiners & Macaroni; Stuffed Bell Pepper (Special); Zucchini Squash, English Peas, Rice.

Friday: Seafood Gumbo; Baked Flounder, 1/4 Broiled Chicken w/Peach Half, Salisbury Steak (Special); Cauliflower au Gratin, Mixed Vegetables, Buttered Cabbage, Whipped Potatoes.

Week of January 24 - 28, 1983

Monday: Chicken & Rice Soup; Texas Hots & Beans, BBQ Ham Steak, Steak Parmesan, Beef & Macaroni (Special); Green Beans, Carrots, Au Gratin Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Tomato Soup; Potato Baked Chicken, BBQ Spare Ribs, Mexican Dinner (Special); Squash, Ranch Beans, Spanish Rice, Broccoli.

Wednesday: Seafood Gumbo; Baked Turbot, Liver & Onions, BBQ Ham Steak, Baked Meatloaf w/Creole Sauce (Special); Beets, Brussels Sprouts, Green Beans, Whipped Potatoes.

Thursday: Beef & Barley Soup; Chicken & Dumplings, Corned Beef w/Cabbage, Smothered Steak w/Cornbread Dressing (Special); Spinach, Cabbage, Cauliflower au Gratin, Parsley Potatoes.

Friday: Seafood Gumbo; Pork Chop w/Yam Rosette, Creole Baked Cod, Tuna & Salmon Croquette (Special); Brussels Sprouts, Green Beans, Buttered Corn, Whipped Potatoes.

Roundup Swap Shop

Ads must be under 20 words total per person, double spaced, and typed or printed. Deadline for submitting or cancelling ads is 5 p.m. the first Wednesday after publication. Send ads to AP3 Roundup, or deliver them to the Newsroom, Building 2 annex. No phone-in ads will be taken. Swap Shop is open to JSC federal and on-site contractor employees for non-commercial personal ads.

Property & Rentals

Co-op special: furnished room in private home, \$155/mo. plus options, utilities paid, available now. Call Jim, x5071 or 480-5097 after 5 p.m.

For lease: 2-1.5-2 townhome, 2 story, ceiling fans, patio, pool, \$450/mo. Call Betty, x6444 or 1-420-2936.

For sale: Middlebrook 4-2-2, formals, paneled den, bookcases and fireplace, energy efficient, low equity, 9.5% VA loan, 2,150 sq. ft. Call Wheeler, x5276 or 486-5346.

For rent: Oakbrook 3-2-2, fireplace, enclosed patio, \$550/mo. Call 474-3507

Property for sale: 52 acres near Fredericksburg, 492 acres near Center. Call Haines, x3851 or 941-2495.

Furnished bedroom for rent, kitchen privileges, washer and dryer, Pasadena area. Call 946-5459 or 473-4588.

Cars & Trucks

1971 Vista Cruiser station wagon, one owner, AC, PS, AM/FM, auto, good tires, well maintained, 86K miles. Call Glen, x5971 or 488-5422.

1977 Ford T-Bird, AM/FM/8-track, new tires, new battery, low mileage, excellent condition, \$2,700 cash. Call Frank, x3836 or x3837.

1971 Del-Ray mini-home on Dodge chassis, fully self-contained, roof and dash air, many extras, \$4,200. Call Cleto Booher, x2759 or 489-8375.

1975 Gran Torino wagon, recently replaced engine, AC, PB, PS, excellent condition, \$1,150. Call Vic Marks, x5975 or 488-3354.

1977 Z-28 Chevy Camaro, 4-speed, AM/FM/8-track, new tires and brakes, \$2,800. Call 644-8936 after 5 p.m.

1977 Plymouth Volare Premier wagon, 68K miles, power, AC, radio, steel radials, major tune up recently, excellent condition, \$2,000. Call Ulrich, x5212 or 487-0307 after 5 p.m.

1979 VW Scirocco, 5 spd., AC, 57K miles, good tires, no rust, runs well, 35 mpg highway, \$4,800. Call Bill Wallace, x6226 or 480-3038.

1973 Datsun 610 4-door, air conditioned. Call x6287 or 488-8996.

1980 Citation, 4 cyl., 4 spd., loaded, 36K miles, available in Jan., \$3,800 firm. Call 534-4603 after 6 p.m.

1981 Pontiac Catalina wagon, power, air, auto overdrive, 25K miles, excellent condition, 21 mpg highway, last of the big GM wagons. Call Steve, 554-2435.

1980 Ford Bronco, excellent condition, 6-inch lift kit, loaded plus, \$8,400. Call 338-2130.

1964 Rambler, 87K miles, \$150 or best offer. Call 649-1493 after 5 p.m.

1969 Ford for sale, parts only, motor and transmission in excellent condition. Call Karen, x3931.

1969 Opel GT, very good condition, no rust, \$1,875. Call 486-5217, after 5 p.m.

1981 Camaro Berinetta, cassette stereo, like new, extras well below Bluebook. Call 334-2360 or 471-1432 after 5 p.m.

1979 Ford Fiesta, 4 spd., AC, recent trans., clutch, tires, motor mounts, needs minor repair, sell below book at \$2,150. Call 488-2455.

1971 Capri, 1600 cc 4 spd., one owner, 45K miles. Call 333-2193.

Cycles

Girl's 20" dirt bike, just rebuilt, \$20. Call Tex Ward, 488-5445.

Girl's 20" Huff "Sweet Thunder" and ladies' 26" 3 spd., both in excellent condition, \$35 each. Call 485-5106.

Boats & Planes

Must sell 1/4 interest in Bonanza, finest IFR Skyhawk you'll ever fly, based at La Porte with good partners. Call Bill Pruett, x4491 or 487-3857.

Piper Lance for rent, AC, club seating, \$85/hr. wet. Call Damewood, 482-5572.

Household

Solid walnut headboard for full or queen size bed, excellent condition, \$30; 25" Motorola color console, excellent working condition, beautiful fruitwood cabinet, \$50. Call 485-5106.

Forty-inch gas range, loaded, \$50; Kenmore dryer, \$25; Philco refrigerator, \$150; double kitchen sink, \$15; bath lavatory, \$5; toilet and tank, \$10; stuffed rocker, excellent condition, \$25. Call 649-1493 after 5 p.m.

Single bed, white campaign style with brass trim, 6-drawer storage underneath, \$125 with mattress. Call 474-2660.

Headboard, brass-look wood, for single bed, never used, asking \$40. Call 474-2660.

Sofa, 108", white w/green leaf design, good condition, \$75. Call Feibelman, x3466 or 333-2877.

Sofa, eight-foot early American, floral print cotton cover, cushions need new covers or minor repairs, structure very good, \$75. Call 471-3025.

Sylvania 25" color TV console, \$250, vacuum cleaner, \$75, refrig./freezer, \$200. Call 482-7546.

Beautiful beige couch, loveseat and ottoman, set cost \$1,400 new, less than one year old. Call Ken Lee, 480-5626.

Pets

Choose from 10 beautiful, stocky, healthy and active black and tan 3/4 German Shepherd pups, will be weaned by mid-January, sire is full Shepherd, mother part Shepherd, part Lab, puppies free for the taking. Call Brian, x5111 or Randy, x3594, or 480-5194 after 5:30 p.m.

Lhasa Apso puppies, AKC registered, \$250. Call 488-2838.

Labrador pups, AKC, yellow, whelped 6 November, both parents hunters, \$200. Call 534-2488.

Wanted

Want non-smoking male to share nice, modern 2BR townhouse in Forest Bend, \$225/mo. plus utilities. Call 996-9416 after 5 p.m.

Wanted: location of self-dry cleaning machine for public use. Call Elaine, x3803.

Want a 15" diameter, approx. 14-16 pitch boat propeller for a Volvo Penta I/O outdrive. Call Jim Westom, x4326 or 488-6643 after 5 p.m.

Want 2-bay horse trailer in serviceable condition. Call Terry White, 332-5177.

Miscellaneous

135mm f2.8 Sonogor lens for Canon FD mount camera, \$25. Call Tex Ward, 488-5445.

17 ft. Combee Airobat, 480 cu. in. Cadillac, new prop exhausts, \$4,000; Bonzar marine radar, new 90-day guarantee, \$800; player piano, newly reconditioned, 50 old-time rolls, \$1,800. Call Waite, x4241 or 333-2442.

Mink stole, \$250 firm. Call x4415 or 333-2359.

Deluxe water filter system, best offer. Call 280-0860.

For sale: U.S. proof sets, 1977082, reasonably priced. Call L. Lovelace, x3544 or 332-6463.

Sears Scholar portable typewriter, elite, \$100. Call Mary Anne, x4295.

Victor cutting torch, Rockwell drill, Black and Decker drill. Call 480-7200.

Auxiliary gas tank, 25 gal. with elec. switch, on '77 Dodge van, needs cleaning, make offer. Call Bill x5511 or 488-6465 evenings.

Handsome turquoise colored three-piece suit, like new, size 38 coat, size 32 pants, \$80. Call 996-9416 after 5 p.m.

5,000 unused 3 cents postage stamps issued in 1940s and 50s, good collector's item for only \$200. Call Jeff, x7429.

Wedding gown, lovely long ivory satin, excellent condition, size 8, \$125. Call Feibelman, x3466 or 333-2877.